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NEW HAMPSHIRE
AGRICULTURAL EXPERIMENT STATION

DEPARTMENT OF CHEMISTRY

INSPECTION OF COMMERCIAL
FERTILIZERS FOR 1921

MADE FOR THE
STATE DEPARTMENT OF AGRICULTURE



By H. R. Kraybill, T. O. Smith and C. P. Spaeth

Inspection of Commercial Fertilizers

There are presented in this bulletin the results obtained in connection with the annual inspection of commercial fertilizers made by the State Department of Agriculture under the direction of The Honorable Andrew L. Felker, Commissioner of Agriculture. Mr. Eugene D. Sanborn, State Inspector visited practically every section of the state and collected samples of 104 different brands.

A careful analysis of the results shows that at the prices which the different brands were sold some furnished very much more plant food for the dollar than others. For instance, the average cost of nitrogen per pound in the 1-8-2 fertilizers was almost three times as great as the average cost in the 4-8-4 fertilizers.

Do you consider the actual plant food value of the fertilizer when you buy? This bulletin aims to help you in purchasing your fertilizer for this year. Do not throw it away! Read it! Use it when you buy fertilizer again! It is with the hope that the purchaser of fertilizers will be aided in making his selections that the following discussion of the meaning of the analysis and the methods of calculating values are presented. If you need further help write to the Department of Agricultural Chemistry, The New Hampshire College Agricultural Experiment Station, Durham, N. H.

MEANING OF THE CHEMICAL ANALYSIS.

There are three of the ten elements essential for plant growth which are most apt to be lacking in sufficient available quantity for best crop growth in our usual soils. These are nitrogen, phosphorus and potassium. Sometimes calcium and sulphur may be deficient, but because these deficiencies have apparently not been so marked and wide spread our fertilizer practices have dealt mostly with the application of nitrogen, phosphorus and potassium. The value

of commercial fertilizers depends, therefore, upon their available content of these three elements. For this reason manufacturers are required to state upon their label the guaranteed content of these three materials.

Nitrogen. Pure nitrogen is a colorless, odorless, tasteless gas which makes up about four-fifths of the air surrounding us. In this form, however, it is not available to plants with the exception of a few, such as legumes, which are able to get nitrogen from the air by means of the bacteria which exist upon their roots. In order to be available for plants nitrogen must be in the form of a compound known as a nitrate.

In commercial fertilizers the nitrogen occurs in three different forms as follows: (1) nitrate, (2) ammonia and (3) organic nitrogen. The nitrate nitrogen is readily soluble in water and immediately available to the plant. The ammonia nitrogen and organic nitrogen must be converted into the nitrate form before they are available to the plant. The ammonia nitrogen becomes available quite rapidly during the growing season and so can be considered as an available form. Some types of organic nitrogen such as are contained in dried blood, cottonseed meal, tankage, etc., are also rapidly converted into nitrate nitrogen in the soil and made available to the plant. Other types of organic nitrogen like those contained in hoof, hair and leather waste, however, are only very slowly converted into nitrate nitrogen and are not readily available.

Phosphorus occurs in the various fertilizer materials in the greater part as phosphoric acid in combination with calcium (or lime). In order to be available to plants these compounds of lime and phosphorus must be soluble or made soluble. The amount of lime combined with the phosphoric acid determines the solubility of the material; that containing the smallest amount of lime being most soluble. That part of the phosphoric acid which is readily soluble in water is immediately available to the plant during the growing season. This is known as "water soluble" phosphoric acid.

A part of the phosphoric acid which is insoluble in water is soluble in a certain strength of ammonium citrate solution. This is known as "citrate soluble" or "reverted" phosphoric acid. This is also available to the plant. In the analysis the "available" phosphoric acid includes the "water soluble" and the "citrate soluble." The insoluble may be obtained by subtracting the available from the total in the tables of analyses. The "insoluble" phosphoric acid becomes available to the plant only very slowly.

Potassium occurs in commercial fertilizers usually in the form of a chloride (muriate) or sulphate. Only the water soluble potassium is readily available to plants. The analysis, therefore, expresses the percentage of "water soluble" potash (K_2O).

Statement of the Analysis. There are numerous ways of expressing the amounts of nitrogen, phosphoric acid and potash contained in a fertilizer. The purchaser should not be misled by these statements. For instance, if a fertilizer contains 3 per cent of nitrogen it may be expressed as nitrogen 3 per cent, as nitrogen equivalent to 3.63 per cent ammonia or as nitrogen equivalent to 14.1 per cent of ammonium sulphate. The per cent of nitrogen is the thing which is important and is the figure which should be used in calculating the value of the fertilizer. The following shows how to calculate the per cent of nitrogen from the per cent of ammonia and vice versa. The nitrogen per cent multiplied by 1.21584 gives the per cent of ammonia. The per cent of ammonia multiplied by 0.82247 gives the per cent of nitrogen. Do not be misled by thinking that a tag stating 3.29 per cent of nitrogen and nitrogen equivalent to 4 per cent of ammonia means that the fertilizer contains the sum of these two. It does not. It means that the fertilizer contains 3.29 per cent of nitrogen only.

For convenience phosphorus is expressed as per cent of "phosphoric acid" or P_2O_5 (Phosphorus pentoxide). The tag usually gives the total per cent of "phosphoric acid", the "water soluble", "citrate soluble" and "insoluble." For the

purpose of figuring out the value of these we can take the sum of the "water soluble" and the "citrate soluble" and call it available phosphoric acid. The per cent of available phosphoric acid is the figure to use in determining the value of the fertilizer. Potassium is expressed as per cent of available K_2O or potash. This is water soluble and available to the plant.

METHOD OF CALCULATING THE RELATIVE COMMERCIAL VALUE.

The commercial value of a fertilizer is based upon the content of available nitrogen, phosphoric acid (P_2O_5) and potash (K_2O). If we know the guaranteed analysis and the commercial value of a pound of each of the plant foods, we can calculate the relative values of fertilizers.

The terms unit of nitrogen, unit of phosphoric acid or unit of potash are sometimes used to express the amounts instead of the per cent. The term "unit" means 20 lbs. per ton (2000 lbs.) or 1 per cent. One unit then means 1 per cent of a ton or 20 lbs. A fertilizer having 3 per cent nitrogen has three units of nitrogen per ton, or 60 lbs. per ton.

Prices of Plant Materials. It is impossible to give accurate figures for the cost of the different plant foods because the cost of mixing, bagging, freight and the manufacturers' and dealers' profits vary with the quantity purchased, distance shipped and number of persons through whose hands the material has passed. It is possible, however, to arrive at figures which are sufficiently accurate for use in comparing the relative value of fertilizers.

Acid phosphate containing 16 per cent of available phosphoric acid was purchased for \$28.00 per ton. One ton then contained 0.16 times 2000 lbs. or 320 lbs. of available phosphoric acid. The cost per lb. was $\$28.00 \div 320$ or $\$0.08\frac{3}{4}$ and one unit of available phosphoric acid cost $20 \times \$0.08\frac{3}{4}$ or \$1.75.

Muriate of potash averaging 51.5 per cent of water

soluble potash sold for an average price of \$126.50 per ton. One ton contained 0.515×2000 lbs. or 1030 lbs. of water soluble potash. The cost per lb. was $\$126.50 \div 1030$ or \$0.122 per lb. and one unit of water soluble potash cost $20 \times \$0.122$ or \$2.45.

The average cost of nitrate of soda containing 15 per cent nitrogen is \$80.00 per ton. One ton contains 2000×0.15 or 300 lbs. nitrogen which makes the cost $\$80.00 \div 300$ or approximately \$0.27 per pound and the price per unit is $20 \times \$0.27$ or \$5.40. The average cost of tankage is \$55.00 per ton and it contains an average of 5.58 per cent nitrogen and 5.50 per cent available phosphoric acid. The value of the 5.5 units of phosphoric acid is $5.5 \times \$1.75$ or \$9.62 making the nitrogen cost $\$55.00 - \9.62 or \$45.38. The cost per unit of nitrogen then is $\$45.38 \div 5.58$ or \$8.13 and the cost per lb. is \$0.405. If we assume that our complete fertilizers contain both forms of nitrogen we can approximate an average and use \$0.32 per lb. and \$6.40 per unit.

These figures will not give the price at which fertilizers should be sold within the state but they can be used to determine the relative value of the same brands which may be offered to the purchaser.

PRICES OF PLANT FOOD MATERIALS.

	Per unit.	Per pound.
Nitrogen	\$6.40	\$0.32
Phosphoric acid (P_2O_5) available	1.75	0.0875
Potash (K_2O) water soluble	2.45	0.1225

Either the unit or the pound method can be used to calculate the commercial value of the fertilizer. If we have a fertilizer with the following guaranteed analysis:

Nitrogen total	3.00%
Phosphoric acid (P_2O_5) available	8.00%
Potash (K_2O) water soluble	2.00%

by the unit method we find:

Nitrogen	$3 \times \$6.40 = \19.20
Phosphoric acid available	$8 \times 1.75 = 14.00$
Potash water soluble	$2 \times 2.45 = 4.90$
Total commercial value	<u>\$38.10</u>

By this method we multiply the per cent of each plant food by the cost per unit and then add these figures to give the total value.

Employing the pound method we obtain:

$3 \times 20 =$ Number of pounds of nitrogen in a ton	$60 \times \$0.32 =$	\$19.20
$8 \times 20 =$ Number of pounds of phosphoric acid in a ton	$160 \times .0875 =$	14.00
$2 \times 20 =$ Number of pounds of potash water solu- ble in a ton	$40 \times .1225 =$	4.90
Total commercial value		<u>\$38.10</u>

The per cent means the number of pounds in 100 pounds. Since there are twenty hundred pounds in a ton we multiply the per cent by twenty to find the number of pounds of each plant food in a ton. Then by knowing the value of these per pound we can figure the value of each plant food per ton.

HIGH GRADE VERSUS LOW GRADE FERTILIZERS

The content of available nitrogen, phosphoric acid (P_2O_5) and potash (K_2O) determines the value of a commercial fertilizer. Because it costs just as much to mix, bag and to ship a ton of low grade fertilizer as it does for a ton of high grade fertilizer, the cost of the same amount of plant food must be much higher in the low grade fertilizer.

The average cost of a 1-8-2 fertilizer the past season was \$51.40. The value of the 8 units of P_2O_5 was $8 \times \$1.75$ or \$14.00. The value of the 2 units of potash was $2 \times \$2.45$ or \$4.90. The value of the available phosphoric acid and potash then was \$14.00 plus \$4.90 or \$18.90 and the nitrogen cost \$51.40 minus \$18.90 or \$32.50. The average content of nitrogen was 0.94 per cent. One ton then contained $.0094 \times 2000$ or 18.8 pounds of nitrogen. The cost per pound of nitrogen was $\$32.50 \div 18.8$ or \$1.73. The cost per unit was $20 \times \$1.73$ or \$34.60. On the same basis the average cost per unit of nitrogen in the 4-8-4 fertilizer was \$13.00 or less than half as much as in the 1-8-2 fertilizer.

Table No. 1 gives the cost of nitrogen in the different brands of complete fertilizers, tankage and nitrate of soda analyzed this past season.

TABLE I.

Average Cost of Nitrogen in Complete Fertilizers, Nitrate of Soda, Tankage and Sheep Manure.

Formula.	Average cost of one pound of nitrogen.	Average cost of one unit (20 lbs.) of nitrogen.	Average retail price per ton of complete fertilizers.
1-7-1	\$1.60	\$32.00	\$42.00
1-8-2	1.73	34.60	51.40
1-10-1	1.37	27.40	50.00
1-10-2	2.02	40.40	60.00
2-8-2	1.01	20.20	55.00
2-8-3	1.01	20.20	55.20
2-8-4	1.04	20.80	58.00
2-8-6	.98	19.60	62.00
2-10-3	.70	14.00	55.00
2-10-4	.99	19.80	60.00
2-10-6	.98	19.60	65.00
3-8-3	.79	15.80	61.00
3-8-4	.75	15.00	62.40
3-9-2	.78	15.60	61.00
3 1/2-10-4	.44	8.80	60.00
4-8-4	.65	13.00	67.80
4-8-6	.60	12.00	67.60
4-8-7	.37	7.40	56.00
5-8-4	.58	11.60	72.00
5-8-7	.37	11.80	78.00
6-6-4	.62	12.40	81.60
Nitrate of soda	.27	5.40	80.00
Tankage	.40	8.00	55.00
Sheep manure	1.54	30.80	59.82

CLASSIFICATION OF SAMPLES ANALYZED.

Table II gives the number of samples collected and analyzed in each of the respective classes.

TABLE II.

Complete Fertilizers	74
Ammoniated Superphosphates	1
Plain Superphosphates	5
Sheep Manures	6
Ground Bone	4
Nitrate of Soda	4
Muriate of Potash	2
Tankage	2
Miscellaneous	6

COMPLETE FERTILIZERS.

Table III shows the average analysis and average retail price for the samples of complete fertilizers analyzed. There were seventy-four samples of complete fertilizers, representing about the same relative number of the total samples as in 1920. The brands are very similar to those of 1920. The prices are slightly lower than in 1920.

TABLE III.

Formula.	Number of brands.	Average per cent of nitrogen.	Average per cent of total phosphoric acid.	Average per cent of available phosphoric acid.	Average per cent of water soluble potash.	Average retail price per ton.
1-7-1	1	.85	8.14	6.35	1.17	\$42.00
1-8-2	7	.94	9.22	8.05	2.08	51.40
1-10-1	2	1.09	12.10	10.48	1.26	50.00
1-10-2	1	.93	11.12	10.00	2.00	60.00
2-8-2	13	1.78	9.46	7.91	2.15	55.00
2-8-3	11	1.67	8.95	7.96	3.11	55.20
2-8-4	1	1.64	9.71	8.89	4.29	58.00
2-8-6	1	1.69	9.38	8.00	6.00	62.00
2-10-3	1	2.15	17.95	8.72	3.00	55.00
2-10-4	1	1.64	11.57	10.04	4.41	60.00
2-10-6	1	1.67	10.97	10.40	6.00	65.00
3-8-3	3	2.51	9.38	8.43	3.04	61.00
3-8-4	8	2.55	9.21	8.35	4.13	62.40
3-9-2	3	2.57	9.88	9.10	2.06	61.00
3½-10-4	1	3.66	14.75	9.29	4.52	60.00
4-8-4	8	3.35	9.21	7.97	4.13	67.80
4-8-6	5	3.19	9.30	7.79	5.79	67.60
4-8-7	1	3.31	9.93	8.73	7.00	56.00
5-8-4	1	4.10	9.29	7.43	4.05	72.00
5-8-7	1	3.96	9.07	8.33	6.86	78.00
6-6-4	3	4.94	7.53	5.87	4.22	81.60

Seven brands of 1-8-2 fertilizers show an average analysis of 0.94 per cent of nitrogen, 8.05 per cent available phosphoric acid and 2.08 per cent of potash. The price ranged from \$48.00 to \$54.00 per ton. Thirteen brands of 2-8-2 fertilizers show an average of 1.78 per cent nitrogen, 7.91 per cent available phosphoric acid and 2.15 per cent potash. The price ranged from \$50.00 to \$60.00 per ton. Eleven brands of 2-8-3 fertilizers show an average of 1.67 per cent nitrogen, 7.96 per cent available phosphoric acid and 3.11 per cent potash. The price ranged from \$52.00 to \$67.00 per ton. Eight kinds of 4-8-4 fertilizers averaged 3.35 per cent nitrogen, 7.97 per cent available phosphoric acid and 4.13 per cent potash. The price ranged from \$48.00 to \$75.00 per ton.

The wide range of prices show the necessity of selecting your fertilizers so that you obtain the most plant food for the dollar. Table I emphasizes this point also.

ACIDULATED PHOSPHATES.

Five brands of acid phosphates were analyzed which showed from 16 per cent to 16.75 per cent available phosphoric acid averaging 16.49 per cent available phosphoric acid. The price ranged from \$28.00 to \$42.00 per ton. The wide range in prices here suggests again the need for care in buying fertilizers.

SHEEP MANURES.

Six brands of sheep manure were analyzed which averaged 1.72 per cent nitrogen, 1.07 per cent phosphoric acid and 2.01 per cent potash. The price ranged from \$55.00 to \$64.00 per ton, averaging \$59.82. Figuring their value upon the basis of the cost of phosphoric acid in acid phosphate of \$1.75 per unit, potash in muriate of potash as \$2.45 per unit, and nitrogen in tankage at \$8.13 per unit, we find the average value of these sheep manures to be \$20.53 per ton. *Their cost was just about three times their commercial value.*

DEFICIENCIES IN ANALYSIS.

Forty-three brands out of the 104 samples analyzed, or 41.3 per cent, showed a deficiency of 0.2 per cent or more in one or more of the plant foods, nitrogen, phosphoric acid and potash. In 1920 twenty-two per cent of the samples showed deficiencies. This indicates a serious loss to the farmer using the brands which showed these deficiencies.

ANALYSIS OF BRANDS.

The following table shows the detailed results of the analyses of the different brands. In the table the names of the manufacturers are arranged alphabetically and under the name of each manufacturer the different brands are arranged alphabetically.

AMERICAN AGRICULTURAL AND CHEMICAL COMPANY,
New York, N. Y.

	NITROGEN.		PHOSPHORIC ACID.				POTASH.	
	Guaranteed.	Pound.	Total.		Available.		Guaranteed.	Pound.
			Guaran- teed.	Pound.	Guaran- teed.	Pound.		
Boston Fine Ground Bone.....	2.06	1.69	22.88	29.00	.....	.....	.....	.....
Bradley's Complete Manure.....	4.94	4.83	7.00	6.86	6.00	6.00	4.00	3.87
Bradley's Corn Phosphate.....	1.65	1.67	9.00	9.00	8.00	8.00	2.00	2.33
Bradley's Eclipse Phosphate.....	0.82	1.24	9.00	8.69	8.00	8.00	2.00	2.36
Bradley's Northland Potato Grower.....	3.29	3.21	9.00	9.00	8.00	7.58	4.00	4.00
Bradley's Potato Fertilizer.....	1.65	1.58	9.00	9.01	8.00	8.17	3.00	3.01
Bradley's Potato Manure.....	2.47	2.77	9.00	9.46	8.00	8.27	4.00	4.29
Bradley's XL Super-Phosphate of Lime.....	2.47	2.60	10.00	10.00	9.00	9.21	2.00	2.00
Crocker's New Rival Ammoniated Bone Super-Phosphate.....	0.82	0.86	9.00	8.69	8.00	8.10	2.00	2.00
Crocker's Potato, Hop, and Tobacco Fertilizer.....	1.65	1.65	9.00	9.00	8.00	8.00	3.00	3.09
Grass and Lawn Top Dressing.....	4.94	5.06	7.00	7.47	6.00	5.57	4.00	4.42
Grass and Oats Fertilizer.....	.....	.....	13.00	13.00	12.00	12.03	2.00	2.00
Great Eastern General.....	0.82	0.83	9.00	8.80	8.00	7.15	2.00	2.00
Great Eastern Northern Corn Special.....	1.65	1.49	9.00	8.85	8.00	7.66	2.00	2.00
Great Eastern Potato Manure.....	1.65	1.65	9.00	8.76	8.00	7.83	3.00	3.00
Muriate of Potash.....	.....	.....	.....	.....	.....	.....	48.00	50.28
Nitrate of Soda.....	15.00	15.02	.....	.....	.....	.....	.....	.....
Pacific Potato Special.....	1.65	1.66	9.00	8.68	8.00	7.67	3.00	3.22
16% Plain Super-Phosphate.....	.....	.....	17.00	17.35	16.00	16.00	.....	.....
Quinnipiac Corn Manure.....	1.65	1.84	9.00	9.00	8.00	8.29	2.00	2.32
Quinnipiac Potato Manure.....	2.47	2.08	9.00	9.49	8.00	8.69	4.00	3.12
Quinnipiac Potato Phosphate.....	1.65	1.71	9.00	9.00	8.00	8.71	3.00	3.16
Soluble Pacific Guano.....	1.65	1.77	9.00	9.06	8.00	8.10	2.00	2.00
Williams & Clark American Corn Phosphate.....	1.65	1.78	9.00	9.00	8.00	8.00	2.00	2.19
Williams & Clark American Potato Manure.....	1.65	1.67	9.00	9.16	8.00	7.78	3.00	3.21

Analyses of Brands—Continued.

	NITROGEN.		PHOSPHORIC ACID.				POTASH.	
	Guaranteed.	Found.	Total.		Available.		Guaranteed.	Found.
			Guaran- teed.	Found.	Guaran- teed.	Found.		
ARMOUR FERTILIZER WORKS, Chrome, N. J.								
Armour's 3-8-4	2.47	2.28	8.50	8.99	8.00	8.26	4.00	4.15
Armour's Big Crop Fertilizer	1.65	1.67	10.50	10.97	10.00	10.40	6.00	6.00
Armour's Corn Grower Fertilizer	1.65	1.65	8.50	9.43	8.00	8.00	2.00	2.00
Armour's General Crop Fertilizer	0.82	0.85	7.50	8.14	7.00	6.35	1.00	1.17
Armour's Potato and Onion Fertilizer	3.29	3.29	8.50	8.80	8.00	7.47	4.00	4.00
Sheep Manure	1.23	1.43	1.00	0.12	.....	.....	2.50	2.50
BOWKER FERTILIZER COMPANY, Boston, Mass., and New York, N. Y.								
All-Round Fertilizer	2.47	2.50	9.00	8.51	8.00	8.13	4.00	4.16
16% Acid Phosphate .....	.....	.....	17.00	17.42	16.00	16.50	.....	.....
Corn, Grain and Grass Phosphate	1.65	1.73	9.00	9.00	8.00	8.00	2.00	2.09
Hill and Drill Phosphate	2.47	2.47	10.00	9.39	9.00	9.00	2.00	2.11
Potato and Vegetable Phosphate	1.65	1.74	9.00	8.62	8.00	8.00	3.00	3.21
Stockbridge Early Crop Manure	4.11	3.96	9.00	9.07	8.00	8.33	7.00	6.86
Stockbridge Market Garden Manure	3.29	3.40	9.00	9.00	8.00	8.00	4.00	4.00
Stockbridge Top Dressing and Forcing Manure	4.94	4.94	7.00	8.25	6.00	6.04	4.00	4.36
Sure Crop Phosphate	0.82	0.97	9.00	9.11	8.00	8.56	2.00	2.19
JOSEPH BRECK AND SONS, Boston, Mass.								
Sheep Manure Ram's Head Brand	1.84	1.57	1.25	0.74	.....	.....	3.00	2.01

BURLINGTON RENDERING COMPANY, Burlington, Vt.								
Burlington 1-10-1 Fertilizer	0.82	1.36	11.00	11.80	10.00	10.78	1.00	1.36
Burlington 3-8-4 Fertilizer	2.46	3.14	9.00	9.22	8.00	8.00	4.00	4.39
Nitrate of Soda		15.13						
CHICAGO FEED AND FERTILIZER COMPANY, Osborn, Ind.								
Sheep Manure Magic Brand	1.85	1.68	1.50	1.95			1.25	1.38
JOHN C. DOW COMPANY, Boston, Mass.								
Dow's Garden Fertilizer	3.69	4.19	15.00	16.43	12.00	7.51		
Dow's Pure Ground Bone	2.00	2.54	24.00	24.00				
EASTERN STATES FARMERS' EXCHANGE, Springfield, Mass.								
Eastern States 16% Acid Phosphate				17.82	16.00	16.75		
Eastern States 4-8-4 Fertilizer	3.28	3.41	9.00	9.49	8.00	8.27	4.00	4.53
Eastern States 4-8-7 Fertilizer	3.28	3.31	9.00	9.93	8.00	8.73	7.00	7.00
Nitrate of Soda	14.80	14.41						
ESSEX FERTILIZER COMPANY, Boston, Mass.								
Essex 2-8-2 For Farm and Garden	1.64	2.35	9.00	9.15	8.00	8.07	2.00	2.38
Essex 2-8-3 For All Crops	1.64	1.64	9.00	9.44	8.00	8.00	3.00	3.09
Essex 3-8-3 Fish Fertilizer	2.46	2.46	9.00	9.00	8.00	8.11	3.00	3.03
Essex 3-8-4 Market Garden	2.46	2.64	9.00	9.30	8.00	8.00	4.00	4.15
Essex 4-8-4 Potatoes, Roots, and Vegetables	3.28	3.12	9.00	9.35	8.00	7.74	4.00	4.15
Essex 4-8-6 Potatoes and Vegetables	3.28	2.99	9.00	9.01	8.00	7.35	6.00	6.00
INTERNATIONAL AGRICULTURAL CORPORATION, Woburn, Mass.								
Buffalo Economy	1.50	1.87	9.00	9.80	8.00	8.00	2.00	2.31
Buffalo Farmer's Choice	0.80	0.93	11.00	11.12	10.00	10.00	2.00	2.00
Buffalo High Grade Manure	3.30	3.06	9.00	9.95	8.00	8.10	6.00	5.80
Buffalo New England Special	1.60	1.64	11.00	11.57	10.00	10.04	4.00	4.41
Buffalo Phosphate and Potash			11.00	11.23	10.00	8.98	4.00	4.00
Buffalo Vegetable and Potato	2.50	2.53	9.00	9.31	8.00	8.70	4.00	4.36

Analyses of Brands—Continued.

	NITROGEN.		PHOSPHORIC ACID.				POTASH.	
	Guaranteed.	Found.	Total.		Available.		Guaranteed.	Found.
			Guaran- teed.	Found.	Guaran- teed.	Found.		
INTERNATIONAL PRODUCTS CORPORATION, Norwood, Mass.								
	2.47	2.16	.....	11.98	12.00	9.22	3.00	4.26
LISTER'S AGRICULTURAL CHEMICAL WORKS, Newark, N. J.								
Lister's Corn and Potato Fertilizer	1.65	1.71	9.00	8.78	8.00	8.00	3.00	3.17
Lister's Maine Potato Fertilizer	3.29	3.44	9.00	9.41	8.00	7.81	6.00	6.06
Lister's Squirrel Brand Fertilizer	0.82	0.94	9.00	9.16	8.00	7.77	2.00	2.00
Lister's Success Fertilizer	1.65	1.70	9.00	8.86	8.00	8.15	2.00	2.02
LOWELL FERTILIZER COMPANY, Boston, Mass.								
Acid Phosphate	.....	.....	17.00	17.73	16.00	16.71	.....	.....
Ground Bone	2.05	2.13	26.00	26.00	.....	.....	.....	.....
Lowell Bone Fertilizer 2-8-2	1.64	1.84	9.00	9.68	8.00	8.00	2.00	2.41
Lowell Empress Brand 1-10-1	0.82	0.82	11.00	12.40	10.00	10.18	1.00	1.16
Lowell Vegetable and Grain 2-8-3	1.64	1.71	9.00	9.21	8.00	7.66	3.00	3.00
Lowell 3-8-3	2.46	2.49	9.00	9.39	8.00	8.57	3.00	3.03
Lowell 3-8-4 High Grade Manure	2.46	2.46	9.00	9.39	8.00	8.73	4.00	4.42
Lowell 4-8-4 Potatoes, Corn and Vegetables	3.28	3.65	9.00	9.80	8.00	8.37	4.00	4.00
Lowell 4-8-6 Potatoes and Vegetables	3.28	3.40	9.00	9.40	8.00	7.70	6.00	6.00
6-30 Tankage	4.92	4.72	14.00	14.95	.....	.....	.....	.....
Muriate of Potash	15.00	15.47	.....	.....	.....	.....	53.00	53.00
Nitrate of Soda	.....	.....	.....	.....	.....	.....	.....	.....

MANCHESTER RENDERING COMPANY,
Manchester, N. H.

Manchester Animal Brand Fertilizer.....	2.80	3.66	13.00	14.75	10.00	9.29	4.00	4.52
Manchester Ground Bone	2.05	2.85		25.68	15.00	7.46	.....	.....
Manchester Special Fertilizer for All Crops.....	1.64	2.15	14.00	17.95	10.00	8.72	3.00	3.00
Tankage	5.75	6.45	.....	15.43	8.00	6.85	.....	.....

MONTANA FERTILIZER COMPANY,
Butte, Montana.

Pioneer Fertilizer and Sheep Guano.....		1.65		0.78				2.08
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NATURAL GUANO COMPANY,
Aurora, Ill.

Sheep Manure (Sheep Head Brand).....	2.25	2.42	1.25	1.94			1.50	2.14
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NATURE'S PLANT FOOD CO. OF MAINE,
Byron, Maine.

Nature's Fertilizer and Soil Rectifier.....	1.00	1.49		12.62	3.00	8.50	1.00	3.26
Nature's Plant Food	1.00	0.86	.....	20.31	3.00	1.84	2.00	6.34
Talfa	1.00	1.13	.....	3.11	3.00	0.16	3.00	4.90

NEW ENGLAND FERTILIZER COMPANY,
Boston, Mass.

New England Corn Phosphate 2-8-2	1.64	1.78	9.00	9.92	8.00	8.00	2.00	2.09
New England 2-8-6 Grain, Grass and Potatoes.....	1.64	1.69	9.00	9.38	8.00	8.00	6.00	6.00
New England 3-8-3 Corn, Grain and Vegetables.....	2.46	2.57	9.00	9.76	8.00	8.61	3.00	3.06
New England 4-8-4 Potatoes, Vegetables and Grain	3.28	3.28	9.00	9.00	8.00	7.78	4.00	4.17
New England 4-8-6 Potatoes and Vegetables	3.28	3.05	9.00	8.73	8.00	8.00	6.00	5.07
New England 5-8-4 Potatoes and Vegetables	4.10	4.10	9.00	9.29	8.00	7.43	4.00	4.05

PACIFIC MANURE & FERTILIZER CO.,
San Francisco, Cal.

Sheep Manure, Groz-It-Brand	1.84	1.56	1.25	0.92			3.00	1.98
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Analyses of Brands—Concluded.

	NITROGEN.		PHOSPHORIC ACID.				POTASH.	
	Guaranteed.	Found.	Total.		Available.		Guaranteed.	Found.
			Guaran- teed.	Found.	Guaran- teed.	Found.		
THE COE MORTIMER COMPANY, New York, N. Y.								
E. Frank Coe's Celebrated Special Potato Fertilizer Revised.....	3.29	3.34	9.00	9.23	8.00	8.54	4.00	4.19
E. Frank Coe's Columbian Corn and Potato Fertilizer.....	1.65	1.65	9.00	8.73	8.00	7.72	3.00	3.00
E. Frank Coe's Corn King	2.47	2.63	10.00	10.24	9.00	9.10	2.00	2.07
E. Frank Coe's New Englander Special	0.82	0.82	9.00	10.35	8.00	9.02	2.00	2.00
THE ROGERS & HUBBARD COMPANY, Portland, Conn.								
Complete Phosphate	0.82	0.89	9.00	9.73	8.00	7.71	2.00	2.00
Potato Phosphate	1.64	1.64	9.00	9.71	8.00	8.89	4.00	4.29
WHITMAN-PRATT RENDERING Co., Boston, Mass.								
Whitman-Pratt's 2-8-2 Brand	1.64	1.68	9.00	12.20	8.00	6.60	2.00	2.00
YORK CHEMICAL COMPANY, York, Penn.								
16% Acid Phosphate .....	.....	.....	17.00	16.94	16.00	16.48	.....	.....



